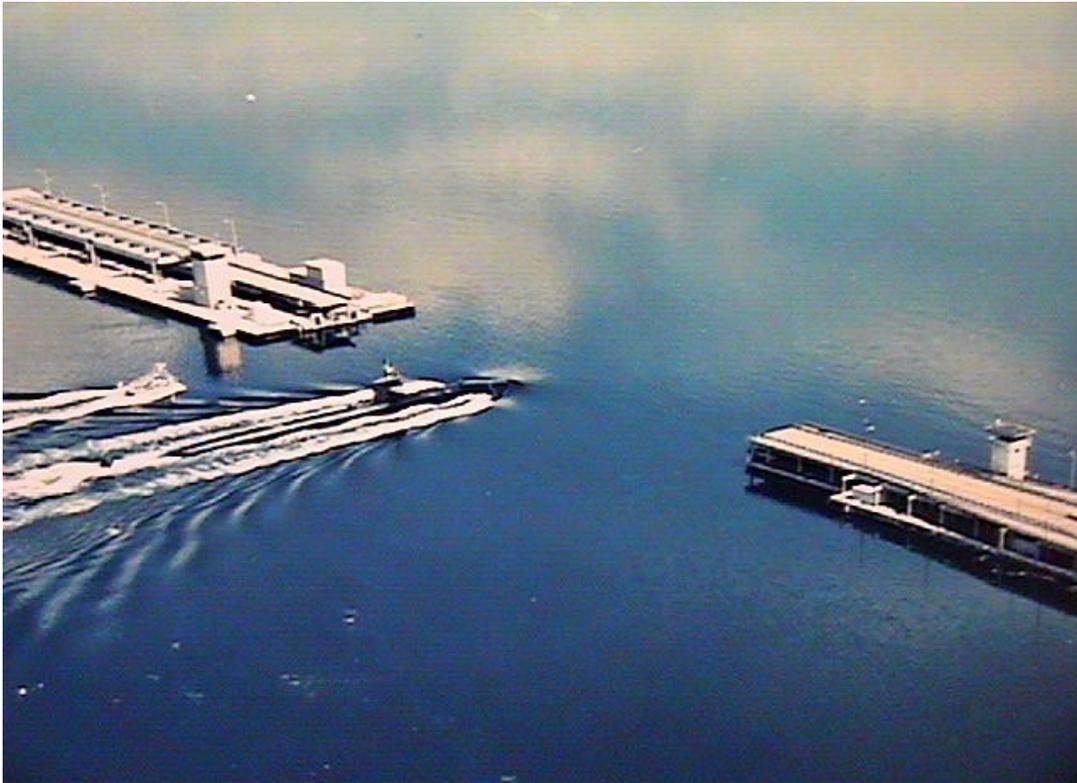


Hood Canal Bridge East-Half Replacement Closure Mitigation Plan – Preferred Options

February 2000



Washington State
Department of Transportation

Hood Canal Bridge Replacement Project Committees

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Hood Canal Bridge East-Half Replacement Closure Mitigation Plan – Preferred Options

February 2000

Our mission is to identify and prioritize options within funding limits that will lessen the impact to users of the Hood Canal Bridge during the East-Half Replacement Project.

*--Hood Canal Bridge Replacement Stakeholder's Committee
Mission Statement (March 1999)*

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and



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EXECUTIVE SUMMARY

The Hood Canal Bridge (William A. Bugge Bridge), on SR104, is vital to the Northern Olympic Peninsula. It provides the only direct transportation link from the Northern Olympic Peninsula to the Kitsap Peninsula and the Central Puget Sound Region. The very existence of the bridge (and any disruption of its ability to provide service) impacts the economic, life-safety and general transportation needs of the Peninsula. Local residents, commuters, freight haulers and recreational travelers make more than 14,000 trips per day across the Hood Canal Bridge.

The bridge, originally opened to traffic on August 12, 1961, has provided this necessary link for more than 38 years. It is situated in a severe marine environment, subject to high tidal fluctuations, strong winds, and open-sea waves. And, during a severe storm event on February 12 and 13, 1979, the west draw-span and west-half floating section sank. Using emergency funds from the federal government, Washington State Department of Transportation (WSDOT) reconstructed the west-half of the bridge and reopened it on October 25, 1982.

It has been determined that the east-half of the Hood Canal Bridge is now reaching the end of its service life and is in need of replacement. WSDOT is in the process of completing the design of the reconstruction and preparing to construct improvements in the 2002 – 2005 timeframe. As a part of that effort, and in cooperation with the Peninsula Regional Transportation Planning Organization (PRTPO), WSDOT is conducting a public outreach program and preparing a Closure Mitigation Plan.

IDENTIFYING THE PROBLEMS

The WSDOT has approached the subject of replacing the east-half of the Hood Canal Bridge in a systematic and deliberate manner. In 1997, WSDOT prepared the **William A. Bugge Bridge (Hood Canal Bridge 104/5.2) Replacement Plan for the East-Half Floating Portion, October 1997**. This report addressed bridge service life, bridge condition, draw-span operations, and storm damage potential. The report did identify several unique issues that favor replacement over bridge rehabilitation including:

- ◆ High salt contamination and bare reinforcing steel suggesting above average post rehabilitation will be required.
- ◆ Inadequate structural capacity to resist winds and wave loads.
- ◆ Prior repair/rehabilitation efforts that have only been partially effective.
- ◆ A second major rehabilitation that is not expected to add more than 20 years to the bridge's service life.

The report concluded that the risk of major storm damage and the resulting agency and owner costs strongly support bridge replacement.

EVALUATING IMPACTS TO THE TRAVELING PUBLIC

As a first step toward understanding the impacts that a bridge closure would have on the traveling public, WSDOT conducted an origin and destination survey in 1998 to collect information on the travel markets served by the Hood Canal Bridge. The information was published in a report titled **Results of the 1998 Hood Canal Bridge Origin and Destination Survey, September 16, 1998 (O&D Survey)***.

* For more information visit the project web page at www.wsdot.wa.gov/regions/olympic/construction/hoodcanal

A number of key findings resulted from the O&D Survey including:

- ◆ Weekend traffic averaged 18,759 vehicles per day, almost 4,000 more vehicles per day than the weekday average of 14,915.
- ◆ Vehicles registered in ten cities near the bridge location accounted for 41 percent of all trips made during the survey period.
- ◆ Trip purpose correlated with frequency of travel over the bridge and the ability of travelers to reschedule their trips.

In 1998, after evaluating the origin and destination information, a public outreach effort was initiated to identify viable alternatives to help ease the burden on the traveling public during a 6- to 8-week bridge closure.

BUILDING PARTNERSHIPS

The Closure Mitigation Plan Project Team consists of a number of agencies, jurisdictions and individuals who have a vested interest in the Hood Canal Bridge.

- ◆ **Washington State Department of Transportation (WSDOT)** is the owner/operator of the bridge and the project lead.
- ◆ **Peninsula Regional Transportation Planning Organization (PRTPO)** is responsible for regional transportation planning on the Northern Olympic Peninsula and, as a partner to WSDOT, is represented on the working committees. Representatives from city and county governments in the four-county area most dependent on the bridge were chosen by the PRTPO to serve on the Closure Mitigation Plan committees.
- ◆ **Others: U.S. Navy, Washington State Ferries, emergency services, transit agencies, freight haulers, and ports.**

Two working committees were organized to facilitate the development of the Closure Mitigation Plan and to ensure active participation by communities most affected by the closure.

- ◆ **Hood Canal Bridge Replacement Advisory Committee (HCBRAC).** The HCBRAC was organized to provide technical assistance to the process of developing closure mitigation measures.
- ◆ **Hood Canal Bridge Replacement Stakeholders Committee (HCBRSC).** The HCBRSC's role was to review the work of the advisory committee (HCBRAC), offer recommendations, and provide overall direction on the development of the Closure Mitigation Plan.

SEEKING SOLUTIONS

The HCBRAC brainstormed 62 transportation options to help address transportation demand during the bridge closure. As a first step toward paring-down the number of options, the committee combined options that were inter-dependent, and refined others to accommodate bridge users' needs – 48 options were presented to the HCBRSC for review.

With HCBRSC oversight, the second-tier evaluation of options was a fatal-flaw analysis that allowed technical committee members to rate each option for "reasonableness" and to consider how well they each addressed the transportation needs of the Hood Canal Bridge user. As the fatal-flaw analysis removed nearly 80% of the options from further consideration, the technical committee then scrutinized their own results by discussing the disposition of each of the 48 options – this gave committee members an opportunity to argue both for and against options that were to remain on the list for further

consideration. In the end, some options were refined for further consideration and a list of 15 options remained.

Upon stakeholder committee review and approval of the 15 remaining options, the third-tier evaluation of options began with the development of “Measures of Effectiveness” (MOE). Ranging from “Cost to Implement” to “Social Impacts”, the MOE offered insight into how well each option addressed the public need and allowed consideration of trade-offs that would be necessary for implementation. After the stakeholders committee reviewed the option list, they directed project staff to offer the option list for public comment.

GATHERING PUBLIC FEEDBACK

The fourth-tier of analysis involved gathering public feedback at four open house meetings. Held in each of the counties surrounding the bridge (Kitsap, Jefferson, Clallam and Mason Counties), these meetings were attended by over 200 citizens who will be affected by a Hood Canal Bridge closure. Through the use of informational flyers, encouraging citizens to vote on their favorite options, and soliciting ideas about options that had not yet been considered, nine preferred options surfaced and two new options were added to the list for further evaluation.

Feedback from the public was presented to both committees in October 1999, and after incorporating committee comments, the preferred options list was developed.

PROPOSED SOLUTIONS

Consistent with the Mission Statement of this phase of the Closure Mitigation Planning process, the project committees identified and approved a set of options for further evaluation, recognizing funding limits and incorporating a combination of transportation alternatives.

To lessen the impact to the users of the Hood Canal Bridge during the East-Half Replacement Project, the project committees, in conjunction with the PRTPO, recommended that WSDOT consider eleven (11) mitigation options. These eleven options are outlined in Table 1.

NEXT STEPS

Where do we go from here? WSDOT, in conjunction with PRTPO and the Committees, will begin engineering design on the “shortlist” of preferred alternatives that resulted from the public process. A Preliminary Engineering effort will begin in early 2000 to evaluate the various mitigation options. This evaluation effort will consider the benefits of the alternatives, the costs of construction and implementation, the general viability of each alternative and the anticipated success of each alternative at addressing the impacts caused by the closure of the bridge. A Closure Mitigation Plan that includes a number of travel and information/education options will result from that engineering effort. It is anticipated that the analysis will be complete and the Closure Mitigation Plan ready for implementation by late 2001.

TABLE 1 – Mitigation Options

1.	Consider initiating <i>Port Townsend to Edmonds car ferry service</i> to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and King County.
2.	Consider initiating <i>Port Townsend to Kingston car ferry service</i> to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and the Kitsap Peninsula.
3.	Consider initiating <i>Port Townsend to Seattle passenger only ferry and increase transit service between existing Park and Ride lots of ferry terminal</i> to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and Seattle.
4.	Consider providing <i>passenger only ferry service across Hood Canal between Lofall and South Point, enhancing existing Park and Ride facilities or building new facilities within fifteen minute radius of the ferry terminals and providing shuttle service between the canal, the Kingston ferry terminal and the Park and Ride facilities</i> . This option would facilitate a percentage of the leisure, commuter, business and medical trips that are currently served by the bridge.
5.	Consider <i>enhancement of US101 corridor by improving existing pullouts and adding passing lanes</i> to facilitate those bridge users who would choose to travel around the canal rather than use ferry service.
6.	Consider providing a <i>freight barge across Hood Canal</i> to facilitate commercial trips between the Kitsap and Olympic Peninsulas.
7.	Consider implementing a <i>Hood Canal Bridge Closure Rideshare Program</i> (e.g. real time ride matching, vanpool program around canal, worker/driver buses around canal, shared vehicles at Park and Ride locations) to facilitate leisure, commuter, and medical trips.
8.	Consider installing <i>signs at decision points leading to the Olympic Peninsula</i> to notify drivers of the Hood Canal Bridge closure and suggest alternate routes. Signs shall be strategically placed to address all Hood Canal Bridge users.
9.	Consider initiating a <i>Hood Canal Bridge public outreach program</i> that includes a multi-faceted public relations program and outreach to cities, counties, chambers of commerce, and public services. Public outreach shall focus on all users and communities affected by the bridge closure.
10.	Consider providing <i>subsidized medical flights</i> between the Olympic Peninsula and Kitsap County or Seattle area.
11.	Consider <i>subsidized housing and/or motels</i> for commuter and medical trips that cannot be “adequately accommodated” by any other option.

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1. INTRODUCTION

The Hood Canal Bridge (William A. Bugge Bridge), on SR104, is vital to the Northern Olympic Peninsula. It provides the only direct transportation link from the Northern Olympic Peninsula to the Kitsap Peninsula and the Central Puget Sound Region. The very existence of the bridge (and any disruption of its ability to provide service) impacts the economic, life-safety and general transportation needs of the Peninsula. Local residents, commuters, freight haulers and recreational travelers make more than 14,000 trips per day across the Hood Canal Bridge.

The Hood Canal Bridge, originally opened to traffic on August 12, 1961, has provided this necessary link for more than 38 years. It is situated in a severe marine environment, subject to high tidal fluctuations, strong winds and open-sea waves. And, during a severe storm event on February 12 and 13, 1979, the west draw-span and west-half floating section sank. WSDOT reconstructed the west half of the bridge with emergency funds and reopened it on October 25, 1982. Since that time WSDOT has developed and implemented a continuous maintenance and rehabilitation plan for the bridge. In addition, a number of studies have been undertaken by WSDOT to assess the service life of the bridge and program major reconstruction and component replacements. As a result of these continuing efforts, it has been determined that the east-half of the Hood Canal Bridge is reaching the end of its service life and is in need of replacement. WSDOT is now in the process of completing the design of the reconstruction and preparing to construct improvements in the 2002 – 2005 timeframe. As a part of that effort, and in cooperation with the PRTPO, WSDOT is conducting a public outreach program and preparing a Closure Mitigation Plan. The Closure Mitigation Plan will identify various options for mitigating the impacts of a closure of the bridge and recommend the most viable alternatives for implementation.

This report describes the process conducted by WSDOT and the PRTPO, outlines the options studied and identifies the recommended alternatives.

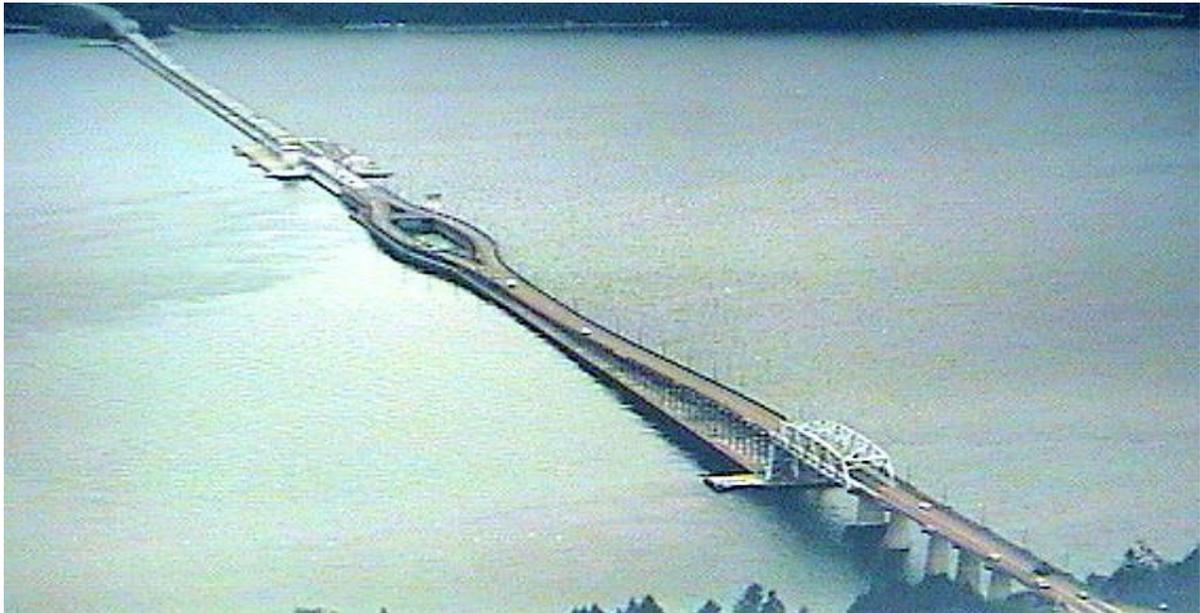


Aerial Photograph of the Hood Canal Bridge (1999)

2. BRIDGE HISTORY

The floating bridge over the Hood Canal along SR104 was originally opened, as a toll bridge, on August 12, 1961. It was officially named the William A. Bugge Bridge on July 12, 1977.

The Hood Canal Bridge is 7,869 feet in length, nearly 1.5 miles long. It has steel truss transition spans and steel plate girder approach spans at each end. The concrete floating pontoons reach a total length of 6,470 feet. The bridge has a split center draw-span which is designed to provide 600 feet of navigable opening width. This size opening permits the movement of both small recreational and large ocean-going vessels into and out of the Hood Canal. U.S. Navy ships, including Trident submarines, are included in the list of vessels that pass through the Hood Canal Bridge frequently.



Hood Canal Bridge (Looking West)

The Hood Canal Bridge is located in a severe marine (salt-water) environment. It must withstand open sea waves, strong winds and tidal fluctuations of as much as 16.5 feet. It provides a connection between the Olympic and Kitsap Peninsulas across a body of water that reaches 340 feet in depth.

On February 13, 1979, during a severe storm, the west-half of the bridge sank. The structure withstood, and finally succumbed, to sustained winds of up to 85 mph and wind gusts estimated at 120 mph. The 1979 storm that claimed the west-half of the bridge was characterized as a “storm within a storm” due to the high winds and wave action.

WSDOT undertook an emergency replacement project to rebuild the bridge and reopen it to vehicular traffic. Using federal emergency bridge replacement funds, WSDOT designed and constructed the west-half replacement in less than three years. The bridge was reopened on October 25, 1982.

Included in that effort were temporary measures to transport people and freight across the Hood Canal. Measures included redirecting traffic along the Hood Canal via US101 and the implementation of temporary ferries between South Point and Lofall (near the bridge location). These measures met with varying degrees of success.

3. PROJECT HISTORY

3.1. BRIDGE PRESERVATION VS. REPLACEMENT

WSDOT has approached the subject of replacing the east-half of the Hood Canal Bridge in a systematic and deliberate manner. WSDOT engineers and maintenance personnel perform scheduled inspections and tests on the bridge. Required repair and replacement of bridge components is prioritized annually within the state budget. WSDOT's focus is to ensure the bridge affords safe passage for the traveling public while minimizing the risk of storm damage to the structure.

In 1997, WSDOT prepared the **William A. Bugge Bridge (Hood Canal Bridge 104/5.2) Replacement Plan for the East-Half Floating Portion, October 1997**. This report addressed bridge service life, bridge condition, draw-span operations, and storm damage potential. It also included alternatives analysis for maintaining the existing structure vs. structure replacement, a life cycle cost analysis, funding summary, and preliminary engineering schedule. WSDOT also conducted an origin and destination survey in 1998 to collect information regarding use of the Hood Canal Bridge and published the **Results of the 1998 Hood Canal Bridge Origin and Destination Survey, September 16, 1998**. And, in 1998, a public outreach effort to identify viable alternatives for mitigating a bridge closure during replacement efforts was initiated.

3.1.1. BRIDGE CONDITION

The William A. Bugge Bridge (Hood Canal Bridge 104/5.2) Replacement Plan for the East-Half Floating Portion, October 1997, presents a brief history of the bridge and outlines the bridge's condition, expected service life, and maintenance and replacement costs, and schedule. The purpose of the 1997 report was to identify the factors affecting the remaining effective service life of the east-half floating portion, and to evaluate the cost-effectiveness of rehabilitation versus replacement.

The 1997 report noted that various elements of the bridge have deteriorated over the years due to the environmental conditions and uninterrupted operation of the bridge. In 1984, a significant effort to repair spalling concrete members (slabs, beams, columns and pontoons) was undertaken. Bridge columns that support the elevated roadway had begun to show signs of spalling and delamination.

	<p><i>Repairs that have proven reliable on similar structures have proven ineffective on the Hood Canal Bridge. Much of the work done to preserve the structural capacity of the east-half roadway cannot withstand the harsh storms and tidal fluctuations of the Hood Canal.</i></p> 
<p><i>Previously repaired beam spalling.</i></p>	<p><i>1984 repaired column, spalling in 1997.</i></p>

The columns under the east-half roadway have been continuously repaired over the years. However, the supports continue to deteriorate and crack in the extreme Hood Canal environment. The 1997 report noted that in 1996 and 1997 bridge inspectors found areas of new spalling concrete on many of the columns repaired in 1984, and additional spalling on columns that were previously undamaged. Some concrete columns have deteriorated to a point that some structural reinforcing steel has become exposed to the marine air and has begun to rust.

3.1.2. ON-GOING MAINTENANCE AND INSPECTION

While the concrete columns supporting the east-half roadway are showing signs of deterioration, bridge inspectors and maintenance staff have kept vigilant watch over the east-half pontoons as well. The east-half of the Hood Canal Bridge consists of five pontoons in the draw-span area, with each pontoon measuring approximately 360 feet long by 50 feet wide. Experiencing significant corrosion induced delaminations and spalling dating back to the 1970's, all east-half pontoon decks were repaired in 1983-84. Inspection reports by maintenance crews, state inspectors, and independent consultants indicate the pontoons are essentially watertight and have no measurable unsealed cracks. WSDOT has implemented an extensive maintenance effort to check the corrosive forces attacking the reinforcing steel, and a cathodic protection system as one of several experimental projects tried on the bridge to control deterioration. None of the experimental projects proved very successful. Today, maintenance and repair needs on the bridge exceed the Olympic Region's bridge maintenance crew's available resources.

While the historic storm of February 1979 produced only minor damage to the east-half pontoons, it did cause hairline cracking in the pontoon decks and walls (especially in the draw-span area). Additional hairline cracks have been noted during inspections following other storms in subsequent years. Inspection of the outer surfaces of the pontoons is difficult due to calcification of the crack and marine growth on the wetted perimeter of the pontoons. Conclusions regarding pontoon structural integrity cannot necessarily be drawn from cracks observed from the pontoon's interior, as they may be misleading. First, the cracks tend to close when storm induced loads subside. Second, the post-tensioning further contributes to crack closure.

In 1987, the bridge deck slab was overlaid with a 1/4-inch thick epoxy polymer material. Since that time, a number of patches have been made to the overlay. The overlay, which was originally expected to last 12-15 years, is now 13 years old and expected to require a higher level of repairs in the next 3 to 5 years.



Lightweight deck concrete approaches to the bridge need to be upgraded to accommodate modern traffic conditions, and will be replaced during the 6- to 8-week bridge closure.

Corrosion of the east-half roadway deck, roadway supports, and pontoon surfaces continues to create engineering and maintenance challenges. Deterioration of the east-half of the bridge combined with scheduled maintenance and preservation requirements have necessitated a number of projects to keep the bridge operational. (See Table 3-1).

TABLE 3-1 – Bridge Construction/Repair Projects

Project Date	Project Description
Nov 27, 1957	Unit 1 – Floating Structure
Dec 16, 1958	Unit 2 – Approach Structure
May 13, 1959	Unit 3 – West Approach Highway
Aug 31, 1959	Unit 4 – East Approach Highway
Dec 09, 1959	Unit 5 – Toll Plaza and Administration Building
Dec 09, 1959	Unit 6 – Toll Collection Facilities
Aug 24, 1960	Unit 1 – Floating Structure Strengthening & Repair Modifications
Aug 21, 1963	Revise Vertical Trunnion Assemblies; Furnish & Install Power & Control Cables
May 25, 1964	Center Lock Modifications
Jun 23, 1965	Painting
Jun 15, 1973	Fender Repair
Jul 06, 1973	Anchor Cable Replacement
Feb 27, 1974	Toll Booth Modifications
Apr 02, 1974	Painting
Nov 05, 1976	Conduit Repair
Feb 13, 1979	WEST-HALF SINKS IN STORM
Jun 15, 1979	Remove West Truss & Transport for Storage
Oct 10, 1980	West Approach Rehabilitation
Sep 19, 1980	Replace Pontoon Prestressing Tendons
Dec 15, 1980	Pier 3 Strengthening
Jan 08, 1981	West-Half Replacement – Unit 1
Dec 30, 1981	West-Half Replacement – Unit 2
Dec 17, 1981	Furnish & Transport “A” Frame at Transition Truss
Jan 08, 1982	Bridge Approach Signals
Jun 06, 1983	East-Half Pontoon Deck Repair; Cathodic Protection
May 09, 1984	East-Half Rehabilitation
Dec 04, 1984	Fishing Access, East End
May 17, 1985	Signal Communication, Electrical Rehabilitation & Cathodic Protection
Oct 01, 1985	Roller Modification
Jan 17, 1986	East-Half Anchor Cable Replacement
Feb 01, 1987	Cable Replacement on Pontoon “U” North Side
Jul 10, 1987	East-Half Overlay
Aug 12, 1987	Rewire East-Half
Jun 08, 1990	Toll Booth Removal
Jun 15, 1991	Cable Replacement on Pontoon “U” North Side
Aug 31, 1992	Fender Replacement on East-Half
Jul 02, 1993	West Approach Painting
Mar 21, 1995	Replace Grid Decks on Lift Spans & Truss Transition Spans, & Adjacent Expansion Joints

Data has been reprinted from William A. Bugge Bridge (Hood Canal Bridge 104/5.2) Replacement Plan for the East-Half Floating Portion, October 1997

3.1.3. DRAW-SPAN OPERATIONS

In mid-1995, the east-half draw-span began to seize, or become stuck, at the design opening of 300 feet. (Total bridge opening equals 600 feet, utilizing both draw-spans.) By mid-1996, the east draw-span would stick if opened to more than 220 feet. Currently, due to remedial actions by WSDOT crews, the east draw-span can be opened to 295 feet but draw-span reliability is an on-going concern. The opening problem is the result of high loads on the vertical guide-rollers, causing excessive wear on the roller tracks, rollers and equalizer frames. The short-term repair is to systematically eliminate the binding points. The long-term “fix” would require removal of the draw pontoon and replacement of all mechanical components; a costly and time consuming repair.

<p><i>Operation of Drawspan:</i> <i>Limited 560-foot opening for Bangor submarines</i></p> 	<p><i>Reliable operation of the Drawspan is essential to vehicular and marine traffic, and timely openings for Trident submarines.</i></p> 
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3.1.4. STORM DAMAGE POTENTIAL

The storm that caused the damage and sinking of the west-half of the bridge in February 1979 was defined as a “storm within a storm”. It had sustained winds of 85 miles per hour, with wind gusts estimated at 120 miles per hour. The east-half of the bridge is considered to be less affected by severe storms, than the west-half, due to typical wind direction, protection provided by the shoreline and the “fetch” (the distance over water along which the wind blows is usually less at the east-half than at the west-half). ***However, it should be noted that major damage to the east-half is likely for major storm events (10-20 year event), if the storm heading is from the southwest.***

<p><i>Risk:</i> <i>Major storm events create waves and winds that lash at the Hood Canal Floating Bridge</i></p> 	<p><i>The probability and risk of damage from major storms is high. The primary concern regarding the bridge’s remaining service life is based on structural capacity and accumulative fatigue damage caused by major storms.</i></p> <p><i>If this structure is put out of service for any extended period of time, major economic impacts and inconveniences would be felt by highway users. Still fresh in the memories of many is the period of time after the 1979 failure until the bridge was reopened in 1982.</i></p>
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3.1.5. REMEDIES CONSIDERED

The design and details for the new east-half bridge, under the **Replacement** Alternative, will be very similar to the reconstructed (1982) west-half bridge. The east-half replacement plan will have the following configuration: 900 feet of new draw-span pontoons, 900 feet of relocated pontoons currently in storage near the community of Port Gamble, three new roadway pontoons (865 feet in total length), and new cross-pontoons to support the east transition span. The total cost estimated for the replacement of the east-half section including, design and construction engineering, right-of-way, construction and contingencies is approximately \$170 million (in 1998 dollars). The effective service life of a new bridge is 75 years.

The Six-Year **Maintain Only** Alternative is estimated to cost approximately \$1.2 million (in 1998 dollars). This program will exceed the current WSDOT maintenance resources. At the end of the six-year period, the east-half section will still be an old structure that is continuing to deteriorate. This alternative would be considered a short-term stop gap measure at best.

The **Rehabilitation** Alternative would consist of a three-year program to extend the service life of the bridge by 20 years. The estimated cost is \$68 million (in 1998 dollars). This alternative would somewhat mitigate the effects of progressive deterioration and attempt to correct some of the mechanical and electrical problems causing poor reliability of the draw-span operations. However, it would not significantly reduce the risk of storm damage.

3.1.6. FINDINGS

WSDOT's 1997 life-cycle cost analysis did not result in a "best" choice alternative. Specifically, deterioration rates and resulting maintenance and future rehabilitation requirements following new construction were found to be indeterminate and maintenance costs were based on assumptions. Additionally, costs could not be determined for risks associated with 20 years of additional service for a bridge that has structural capacity-to-demand deficiencies for current 10-year storm design criteria. Costs and inconvenience to users due to bridge closures resulting from storm damage were not included. However, the report did conclude that there are several unique issues that favor replacement over bridge rehabilitation including:

- ◆ High salt contamination and bare reinforcing steel suggesting above average post rehabilitation will be required.
- ◆ Inadequate structural capacity to resist winds and wave loads.
- ◆ Prior repair/rehabilitation efforts that have only been partially effective.
- ◆ A major rehabilitation effort will not add more than 20 years to the bridge's service life.

Considering the risk of major storm damage and social/economic impacts associated with intermittent bridge closures, the report concluded that the best option is to pursue replacement of the east-half of the bridge.

3.2. IDENTIFYING IMPACTS TO THE TRAVELING PUBLIC

In 1998, an analysis of bridge traffic was conducted, and the information was summarized in a report titled, **Results of the 1998 Hood Canal Bridge Origin and Destination Survey**. Data for this report was gathered from three sources: daily traffic counts, vehicle registration data collected during an automated video license plate survey, and results of the O&D Survey mailed to vehicle owners identified

in the video survey. Together these three sources provided data on traffic volumes, traffic flow, and the origins and destinations of bridge users.

The video survey was conducted on June 5, 6 and 7, 1998 (Friday, Saturday and Sunday) and on June 9 and 10, 1998 (Tuesday and Wednesday). The month of June was purposefully chosen for the analysis because the 6- to 8-week replacement of the bridge will need to be accomplished in late-Spring/early Summer to minimize the risk of storms during construction.

A number of key findings resulted from the O&D Survey including:

- ◆ Weekend traffic averaged 18,759 vehicles per day, almost 4,000 more vehicles per day than the weekday average of 14,915.
- ◆ Vehicles registered in ten cities near the bridge location accounted for 41 percent of all trips made during the survey period.
- ◆ Trip purpose correlated with frequency of travel over the bridge and the ability of travelers to reschedule their trips.

3.2.1. DAILY TRAFFIC VOLUMES

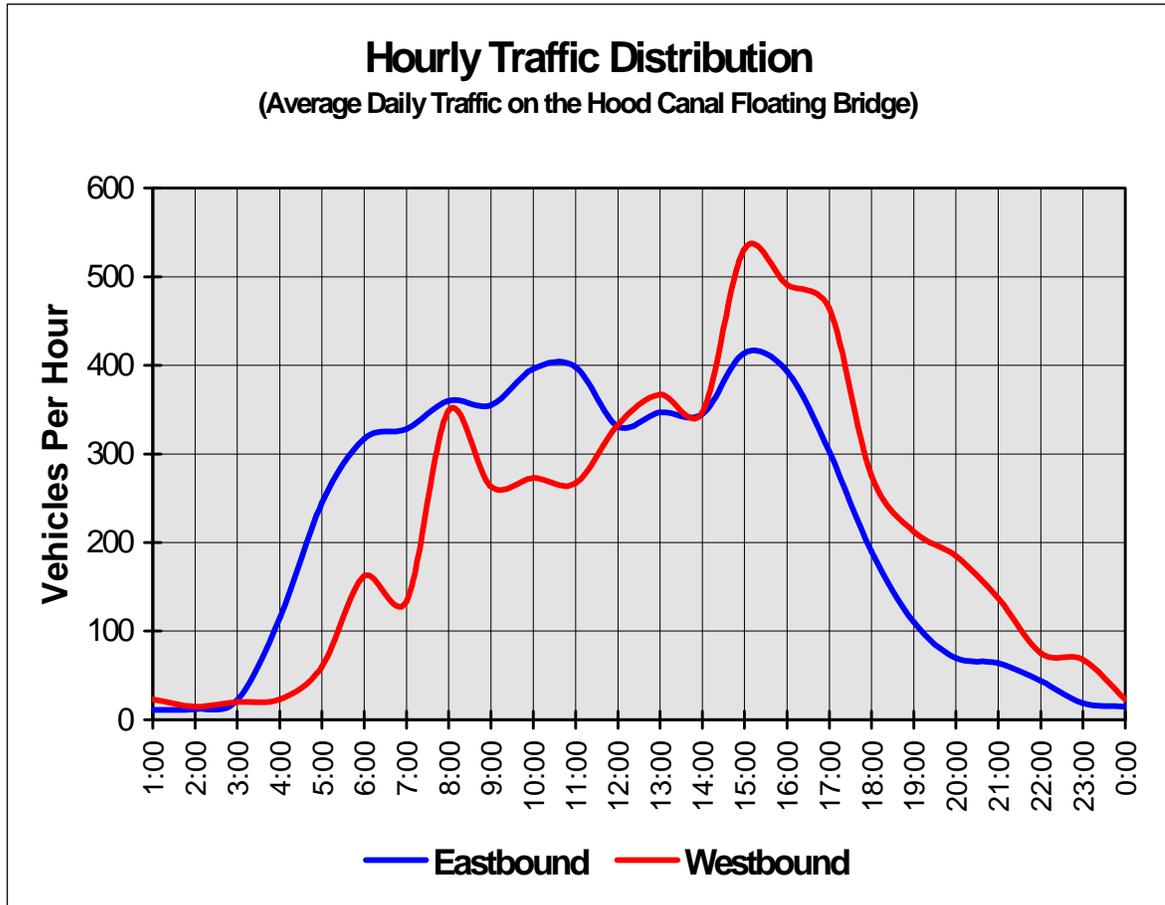
Counts taken during the survey period indicated that daily traffic was higher on the weekends compared to weekdays. This is reflected in the high number of recreational and social trips across the bridge on the weekends. Average weekend traffic volumes (FRI, SAT and SUN) totaled 18,759 vehicles per day. Weekday volumes averaged 14,915 trips per day. Actual counts from the 1998 survey are contained in the following table.

TABLE 3-2 – Daily Traffic Summary

Date	Day	Eastbound	Westbound	Total
June 5	Friday	8,456	9,978	18,434
June 6	Saturday	9,093	9,992	19,085
June 7	Sunday	10,572	8,187	18,759
Weekend Average				18,759
June 9	Tuesday	7,383	7,354	14,737
June 10	Wednesday	7,530	7,562	15,092
Weekday Average				14,915

The traffic counts also showed that weekend traffic begins to increase in the early morning hours and peaks around 11:00 AM. It then remains somewhat constant at that level until evening (7:00 PM) when it begins to decrease. Weekday travel volumes follow a similar pattern. Eastbound traffic tends to peak about mid-morning (10:00 AM). Traffic in both directions tended to remain fairly level until approximately 5:00 PM when the westbound traffic had a slight peak. Traffic in both directions tended to decrease beginning around 6:00 PM.

FIGURE 3-3 – Hourly Traffic Distribution



3.2.2. VIDEO SURVEY

The license plate video survey yielded some interesting information, as well. The majority of users captured in the survey were from cities near the bridge location. Table 3-4 (reproduced from the survey) contains a list of all cities with more than 250 trips, ranked according to the number of trips (over the bridge.)

TABLE 3-4 – Bridge Trips by Volume and Place
(Survey responses during the 5-day study period)

Rank	City, Town, or Community	Count	Population	Per Capita Count	% of Trips Recorded
1.	Port Ludlow	2,848	1,500	1.899	8%
2.	Port Townsend	2,494	8,330	0.299	7%
3.	Port Angeles	2,202	18,890	0.117	6%
4.	Seattle	2,151	536,600	0.004	6%
5.	Sequim	1,839	4,375	0.420	5%
6.	Poulsbo	1,740	6,175	0.282	5%
7.	Bremerton	1,567	38,600	0.041	4%
8.	Port Hadlock	886	2,742	0.323	2%
9.	Silverdale	720	7,660	0.094	2%
10.	Quilcene	695	3,000	0.232	2%
11.	Port Orchard	687	6,965	0.099	2%
12.	Tacoma	646	185,600	0.003	2%
13.	Kingston	621	5,507	0.113	2%
14.	Bainbridge Island	620	18,920	0.033	2%
15.	Bellevue	353	104,800	0.003	1%
16.	Spokane	288	188,300	0.002	1%
17.	Kent	279	62,006	0.004	1%
18.	Renton	276	45,920	0.006	1%
19.	Gig Harbor	259	4,130	0.063	1%
20.	Chimacum	551			1%
	442 Other Places	14,450			39%
Total	462 Places Total	36,172			100%

3.2.3. ORIGIN AND DESTINATION SURVEY

More than 7,000 completed survey responses were received from nearly 18,000 surveys mailed. The survey team was able to use 6,764 of the responses in the survey.

The survey results indicated that the majority of traffic across the bridge was traveling to and/or from cities close to the bridge. Weekend westbound trips originating in central and northern Kitsap County accounted for 48 percent of all trips. The areas near Port Ludlow, Port Townsend, Sequim and Port Angeles accounted for 88 percent of the noted destinations. Eastbound weekend trips were a mirror image of the westbound trips.

Central and northern Kitsap County accounted for nearly 55 percent of all westbound weekday trips. Ninety percent (90%) of westbound weekday destinations were in the Port Ludlow, Port Townsend,

Sequim and Port Angeles areas. As with the weekend trips, the eastbound weekday trips mirrored the westbound trips.

A large number of weekday trips across the bridge appear to be for commuting purposes. Port Ludlow, Port Townsend, Sequim and Port Angeles account for 92 percent of the origins in the morning eastbound peak. Central and northern Kitsap County account for 60 percent of the morning destinations. Seattle accounts for 18 percent of the morning destinations, with other King and Snohomish County areas accounting for an additional 14 percent of the morning commute. The afternoon westbound travel patterns appear to be the reverse of the early morning patterns.

A summary of trip purpose is contained in the following table produced from information contained in the O&D Survey.

TABLE 3-5 – Percentage of Trips vs. Trip Purpose

	Weekend	Weekday
Recreation	21%	8%
Social	21%	9%
Personal	19%	17%
Work	18%	33%
Business	6%	14%
Medical	4%	11%
No Response	4%	4%
Other	8%	7%

The O&D Survey also posed the question, “If you knew before you took the trip that the Hood Canal Bridge was going to be closed, what would you have done?” The following table summarizes the responses to the choices given the participants.

TABLE 3-6 – Percentage of Respondents vs. Alternative Plans

	Weekend	Weekday
Reschedule trip	33%	30%
Other	22%	25%
US101 and Tacoma Narrows	15%	14%
US101 through Olympia	13%	14%
Pt. Townsend / Whidbey Island Ferry	11%	14%
US101 and other	9%	8%
US101 and Ferry	4%	3%
Plane or helicopter	1%	2%

Nearly one third of the people responding stated that they would be able to reschedule their trips. One half of the respondents indicated that they would either reschedule their trips or find alternatives other than re-routing along US101.

The O&D Survey revealed that the majority of cross-bridge traffic typically originates or terminates in the communities close to the bridge. Nearly 21 percent of the trips recorded either began or ended in Port Ludlow, Port Townsend, or Port Angeles. Weekday trips were typically for work, business, personal or

medical reasons. Purposes for weekend trips included recreation, social and personal reasons. And, only 30 percent of the O&D Survey respondents advised that they could reschedule their trips. On a broader scale, this says that 70 percent of the estimated 14,000 vehicles per day crossing the bridge are impacted beyond “rescheduling of trips”.

3.3. STRIVING TO EASE THE PUBLIC BURDEN

The O&D Survey confirmed what WSDOT and the PRTPO already knew: “The Hood Canal Bridge is the vital link between the Olympic and Kitsap Peninsulas. And, that any disruption in the bridge’s ability to provide that link severely impacts the residents of the two peninsulas.”

In response to questions and concerns from the members of the PRTPO, WSDOT undertook a program to develop a Closure Mitigation Plan for the 6- to 8-week period when the bridge is closed during the reconstruction. The development of this mitigation plan included a public awareness and outreach program to identify and evaluate options to mitigate the closure of the Hood Canal Bridge. The Hood Canal Bridge East-Half Replacement Closure Mitigation Plan Project is a joint effort of WSDOT and the PRTPO.

4. INITIATING THE CLOSURE MITIGATION PLAN

The Closure Mitigation Plan is being developed through a systematic and deliberate process. This open process has included significant efforts at public awareness and outreach. The initial identification of potential alternatives was conducted utilizing representatives from communities and businesses from across the Northern Olympic Peninsula Region. The development of criteria for reviewing alternatives and the fatal flaw analysis was also conducted with and/or reviewed by the local representatives to the HCBRAC and HCBRSC. A series of Public Open Houses were held to seek additional input from the general public, especially users of the bridge.

4.1. BUDGET, SCHEDULE AND WORK PROGRAM

The objective of the Closure Mitigation Plan program is to cooperatively develop a coalition of state, regional, local, and community partners to provide project guidance, and evaluate project alternatives. The focus of the work is to develop a Closure Mitigation Plan with project committees and public input. To facilitate this process, Two committees were organized to oversee and offer input to the development of mitigation measures.

- ◆ The HCBRAC to advise, review, and make recommendations on a Closure Mitigation Plan that identifies strategies to address the multi-modal travel demand during the 6- to 8-week closure of the Hood Canal Bridge in the year 2004*.
- ◆ The HCBRSC with representatives from WSDOT/PRTP and other agencies (Navy, Fire, Police, Tribes, etc.) to review and approve the Closure Mitigation Plan.

Once the Closure Mitigation Plan is developed, WSDOT will work with local and regional partners to implement and construct the transportation projects identified in the plan.

The major items of the work program and general timeline milestones are outlined in Table 4-1.

TABLE 4-1 – General Timeline

	Timeline
Organize the HCBRSC and HCBRAC	February 1999
Develop the work program, budget and schedule	March 1999
Identify potential mitigation measures (brainstorming)	April 1999
Develop Measures of Effectiveness	May 1999
Perform initial evaluation of alternatives	July 1999
Seek general public input through a series of open houses	October 1999
Refine the number of viable options	November 1999
Identify preferred alternatives for pre-design	December 1999
Prepare draft Closure Mitigation Plan	January 2000
Preliminary engineering of preferred alternatives	April 2000
Adopt preferred alternatives	September 2001
Develop final Closure Mitigation Plan	November 2001

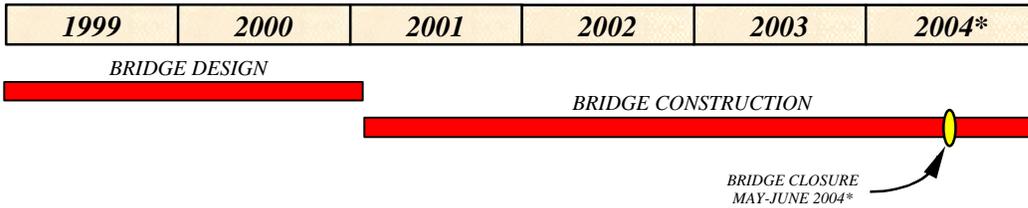
* The project is now expected to be delayed at least one year due to recently decreased funding level. Updated schedule information will be provided at a later date.

The overall schedule for reconstruction of the bridge and development of the Closure Mitigation Plan are depicted on Figure 4-2.

FIGURE 4-2 – Schedules and Timelines

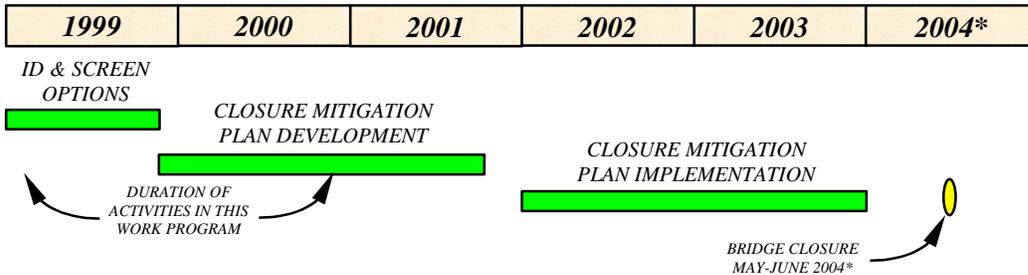
Timeline for the Hood Canal Bridge Replacement

WSDOT Bridge and Structures Section



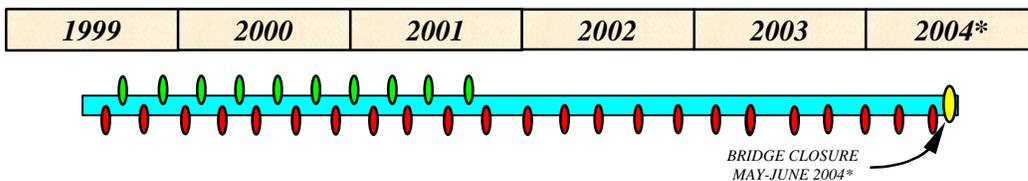
Timeline to Develop and Implement the Closure Mitigation Plan

WSDOT and PRTPO



Timeline for Public Outreach Activities

Public Outreach Consultant



● = Quarterly Outreach Meetings (TBD)

● = PRTPO Presentations

■ = Public Outreach Program Objectives and Components

* The project is now expected to be delayed at least one year due to recently decreased funding level. Updated schedule information will be provided at a later date.

4.2. DECISION MAKING

The decision-making process developed for the Closure Mitigation Plan is designed to include both WSDOT and the PRTPO. In order to organize and evaluate ideas, potential mitigation options and recommended solutions, two committees were formed. The HCBRSC and the HCBRAC consist of representatives from both WSDOT and the PRTPO. These two committees provide input to WSDOT's Olympic Region Administrator, who has the final decision-making authority.

The diagram on the page 22 shows how each of the two established committees and the WSDOT Regional Administrator is afforded an opportunity to review the work efforts and products on a continuous basis. Specific "reviews" are programmed at strategic points along the development process:

- ◆ Identification of options
- ◆ Screening evaluation of options
- ◆ Development of the Draft Plan.

Washington State Department of Transportation (WSDOT). As the owner and operator of the Hood Canal Bridge, WSDOT serves as the project lead for the replacement of the east-half of the bridge and for the development of the Closure Mitigation Plan. The WSDOT Olympic Region Administrator serves as the Chair of the HCBRSC. Staff support to the committees and technical analyses are provided by Olympic Region staff in Tumwater and engineering staff from WSDOT's Project Engineer's Office in Port Orchard. WSDOT's role on the Closure Mitigation Plan project was to manage the project budget, schedule and work efforts, gather input, provide technical analyses, assist with the development of alternatives, approve recommendations, and provide design and implementation of viable mitigation measures. WSDOT had the final decision-making authority through the Olympic Region Administrator. WSDOT also funded the work program, in its entirety.

Peninsula Regional Transportation Planning Organization (PRTPO). The Growth Management Act acknowledged that while the transportation system in Washington State is owned and operated by numerous public jurisdictions, it should function as one interconnected and coordinated system. In order to accomplish this "seamless" functional characteristic, the GMA authorized the formation of regional transportation planning organizations. The PRTPO was formed in December 1991, to coordinate the planning activities concerning regionally significant elements of the overall transportation system on the Kitsap and Northern Olympic Peninsulas. A Regional Transportation Plan (RTP) was developed by the organization, and includes elements dealing with regional land use issues, multi-modal transportation facilities, and financing of system improvements and programs.

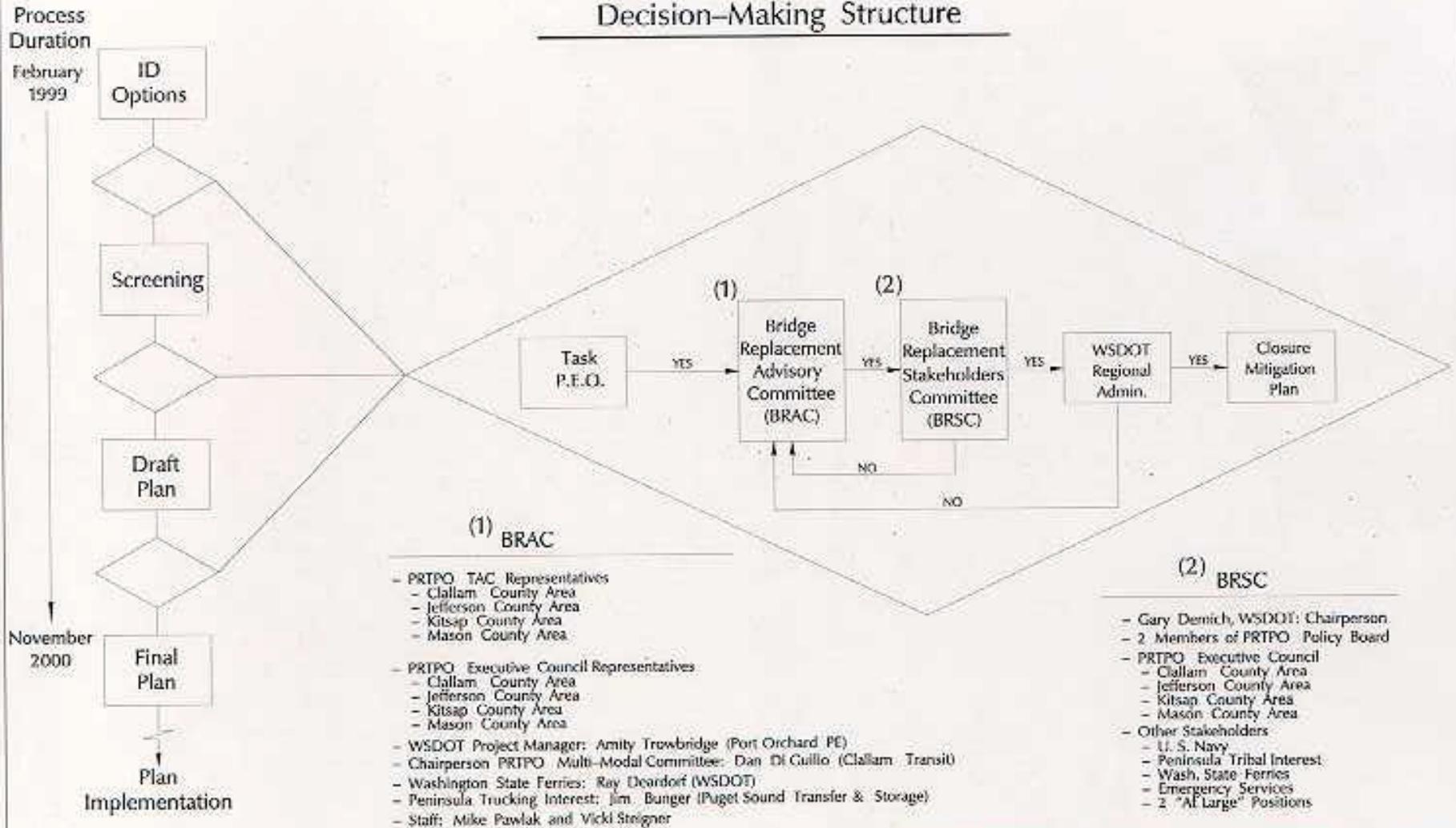
The PRTPO is a three-tier organization. The Executive Council (EC) is the final authority of the organization and is comprised of 13 members and designated alternates, and two ex-officio members (Policy Board and Technical Advisory Committee Chairs). Member jurisdictions with "seats" on the Executive Council include:

- ◆ Clallam County
- ◆ Jefferson County
- ◆ Kitsap County
- ◆ Mason County
- ◆ Port Angeles
- ◆ Sequim
- ◆ Forks
- ◆ Port Townsend
- ◆ Bremerton
- ◆ Port Orchard
- ◆ Shelton
- ◆ Poulsbo
- ◆ Bainbridge Island

The PRTPO's Policy Board (PB) and Technical Advisory Committee (TAC) include representation from the nine jurisdictions (listed above), WSDOT, Washington State Ferries (WSF), tribes, transit, ports, major employers and private ferries.

The PRTPO realized early-on that any disruption in service due to a closure or failure of the Hood Canal Bridge would result in major adverse economic impacts to businesses, governments and individuals on the Northern Olympic Peninsula. During 1997 and 1998, the PRTPO maintained a dialogue with WSDOT regarding future plans to reconstruct the east-half of the bridge. In 1998, members of the PRTPO successfully testified before the Washington State Transportation Committee in support of funding for the design and reconstruction of the bridge. The PRTPO continued to actively participate in this effort through representation on the two project committees.

Hood Canal Bridge Replacement Closure Mitigation Plan Decision-Making Structure



4.3. COMMITTEE STRUCTURES

The Closure Mitigation Plan Project Team consists of a number of public agencies and private sector organizations. WSDOT, as the owner and operator of the Hood Canal Bridge, has an obvious stake in the efforts to replace the east-half of the bridge. The PRTPO, as the regional voice for transportation issues affecting the Northern Olympic Peninsula, has significant concerns with the future of the bridge and any potential closures. Other agencies, such as the U.S. Navy, Washington State Ferries, and local Chambers of Commerce also maintain a significant interest in the bridge. The economic vitality of many communities and local businesses are directly impacted by the operations of the bridge. And, the needs and schedules of individual citizens living and working on the Northern Olympic Peninsula are dependent on the Hood Canal Bridge. In order to address the concerns of all of these agencies, businesses and individuals, representatives from the Region were selected to serve on two committees. In concert with the PRTPO and WSDOT, members of these committees received and offered input to the process, assisted in the identification of closure mitigation alternatives, and recommended to WSDOT preferred alternatives for preliminary engineering analysis.

Hood Canal Bridge Replacement Advisory Committee (HCBRAC). The HCBRAC was organized to provide technical assistance to the process of developing closure mitigation measures. The role of the HCBRAC was to develop a Closure Mitigation Plan for the 6- to 8-week period that the bridge will be closed for replacement of the east-half pontoons. Specific tasks included identifying alternatives, assisting in the screening of alternatives and recommending preferred alternatives to the Stakeholders Committee.

Membership on the HCBRAC included:

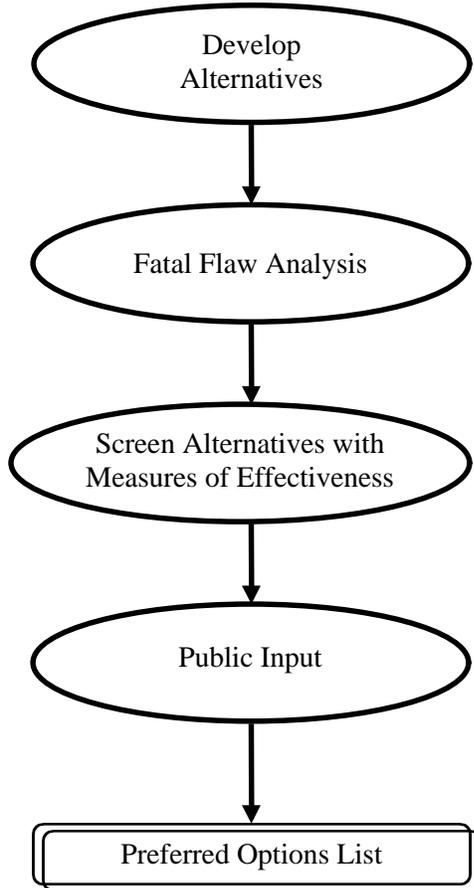
- ◆ 4 members of the PRTPO EC/PB
- ◆ 5 members of the PRTPO TAC
- ◆ 2 transit representatives
- ◆ 4 appointed representatives
- ◆ 1 PRTPO alternate
- ◆ 1 transit alternate
- ◆ 2 invited representatives (private ferries and a port representative)

Hood Canal Bridge Replacement Stakeholders Committee (HCBRSC). The HCBRSC's role was to review the work of the advisory committee (HCBRAC), offer recommendations, and provide overall direction on the development of the Closure Mitigation Plan. Membership on the HCBRSC included:

- ◆ WSDOT Olympic Region Administrator – Chair of HCBRSC
- ◆ 4 members of the PRTPO Executive Council
- ◆ 2 members of the PRTPO Policy Board
- ◆ 1 Tribal representative
- ◆ 1 Transit representative
- ◆ 5 appointed representatives

Complete listings of individuals and agencies involved, are included inside the front cover of this report.

5. EVOLUTION OF OPTIONS



The two project committees were tasked with developing a Closure Mitigation Plan that would ease the burden on the traveling public. Committee work consisted of developing a list of transportation alternatives, reducing the number of alternatives with a fatal flaw analysis, developing a set of MOE and screening those alternatives with MOE. Public input was solicited prior to developing the preferred option list in order to gauge whether the needs of the Hood Canal Bridge user were being met. After the committees had developed and agreed on the preferred list of alternatives, it was forwarded to WSDOT Olympic Region for approval.

Between the two committees, the following mission statement was developed to give focus and direction to the work ahead of them:

Our mission is to identify and prioritize options within funding limits that will lessen the impact to users of the Hood Canal Bridge during the East-Half Replacement

5.1. GLOBAL LIST OF OPTIONS

The first task of the committees was to identify potential alternatives. The HCBRAC brainstormed 62 transportation options ranging from fairly mainstream ideas such as adding ferry service between Port Townsend and Edmonds and more creative ideas such as establishing teleworking satellite offices on the Peninsula. The initial global list of options (see Table 5-1) consisted of systems management and general purpose facility options, transportation demand management options, transit service options, marine service options and airport service options. As a first step toward paring-down the number of options, the committee combined options that were inter-dependent, and refined others to accommodate bridge users' needs. Forty-eight (48) options were presented to the HCBRSC for review.

TABLE 5-1 – Closure Mitigation Plan Global List

1. Enhance US101 corridor by building passing lanes and pullouts.
2. Enhance US101 corridor by modifying bridges along US101 to relieve traffic at pinch points.
3. Relax Washington State Ferries' rules and allow private ferry service on historical Washington State Ferries routes.
4. Extend Port Townsend ferry service hours and keep Port Townsend/Keystone ferry running 24 hours a day with extra runs.
5. Transportation hotline during closure to assist people with transportation needs.
6. Extend Port Townsend ferry service hours and keep Port Townsend/Keystone ferry running 24 hours a day with extra runs and add/enhance a ferry holding lane in Port Townsend.
7. Dedicate another ferry to the Port Townsend to Keystone run ensuring a minimum two boats at all times.
8. Port Townsend to Edmonds Car Ferry.
9. Real Time Ride Matching: coordinate through transit organizations a method of linking travelers with transit opportunities.
10. Initiate Port Townsend to Seattle passenger only ferry and increase transit service between existing Park and Ride lots and Washington State Ferries.
11. Install appropriate signs at decision points leading to the Peninsula to direct drivers away from Hood Canal Bridge (Olympia, Mount Vernon, I-5/SR16 interchange SB)
12. Initiate Port Townsend to Edmonds passenger ferry and increase transit service between existing Park and Ride lots and Washington State Ferries.
13. Enlarge, pave, stripe and provide bus patron shelters at the existing Park and Ride lot at SR104 and SR19.
14. Work with local hotels and motels and encourage them to offer special rates to commuters.
15. Provide a dedicated freight ferry between Edmonds or Seattle and Port Townsend (passengers would be allowed). This ferry would be by appointment and would run 24 hours a day.
16. Coordinate with Cities/Counties/Chamber of Commerce/Tourism Organizations to target events and festivals that will occur during or around the time of the closure and develop an alternate schedule.
17. Provide worker/driver buses for trips around the Hood Canal.
18. Vanpool program around the Hood Canal on US101.
19. Provide a passenger only ferry across Hood Canal at the Lofall/Southpoint location and include a vanpool program to and from foot ferry across the Canal.
20. Enhance the operational characteristics of SR106 by providing slow vehicle pullouts and increasing the shoulder width to minimums.
21. Provide an auto ferry across Hood Canal at the Lofall/Southpoint location.
22. Enhance holding lanes at existing Port Townsend and Kingston ferry locations.
23. Dredging channel at Keystone to accommodate low tides in order to ensure that ferry service will not be interrupted by extreme tides during the 2-month closure.
24. Dedicate another ferry to the Port Townsend to Keystone run ensuring a minimum two boats at all times and add/enhance a ferry holding lane in Port Townsend.

25. Improve Airport In Order to Improve Capacity and Increase Commuter Flights. Lengthen runway, enhance runway, improve waiting facilities?
26. Get US101 declared National Scenic Byway to get additional federal funding.
27. Early Construction Incentives – February instead of May and shorten time.
28. Include in contract for the building of the east-half, a clause making the contractor responsible for all costs associated with the Closure Mitigation Plan beyond the 8-week maximum closure time allowed.
29. Add 0.1% tax to four county area to fund some of ideas (additional funding).
30. Ferry from Port Townsend to Kingston 5 days a week for commuters and then move ferry to Edmonds to Port Townsend run for weekend travel.
31. Enhance the operational characteristics of SR20 route across Whidbey Island (I-5 to Port Townsend Link).
32. Initiate Port Townsend to Seattle passenger only ferry.
33. Initiate Port Townsend to Kingston to Bainbridge Island passenger only ferry.
34. Initiate Port Townsend to Kingston to Bainbridge Island passenger only ferry and increase transit service between existing Park and Ride lots and Washington State Ferries.
35. Initiate Port Townsend Edmonds Passenger Ferry.
36. Increase transit service between all existing Park and Ride lots and Washington State Ferries connections in Kingston, Bainbridge Island, and Port Townsend.
37. Increase transit service for trips around Hood Canal between SR104/SR19 Park and Ride and Shelton area.
38. Partially subsidize circulating airplanes going between airports.
39. Provide telework satellite station (remote office space) in Port Angeles or Sequim with computers and other amenities to allow employees to work away from the normal work site.
40. Provide subsidized housing for 200 people.
41. Identify employers that have several office locations throughout the Kitsap and Olympic Peninsula areas, identify employees in those businesses that are currently traveling across the bridge to get to work and give them the opportunity to switch worksite.
42. Create a training program to encourage flex-time and flex shifts and educate employers and employees about the benefits.
43. Investigate Indian Island/Bangor Connection.
44. Provide a passenger only ferry across Hood Canal at the Lofall/Southpoint location. This option includes the addition of parking at the ferry termini and no added transit services.
45. Provide a passenger only ferry across Hood Canal at the Lofall/Southpoint location. There would be no parking provided at the ferry terminal requiring the use of a shuttle between the ferry and off-site Park and Ride lots.
46. Provide a passenger only ferry across Hood Canal at the Lofall/Southpoint location. There would be no parking provided at the ferry terminal requiring the use of a shuttle between the ferry and off-site Park and Ride lots and increase transit service.
47. Provide charter buses around the canal on US101 for transportation to and from special events and festivals.
48. Subsidize charter planes to deposit tourists at festivals.

5.2. FATAL FLAW ANALYSIS

Because evaluation of each of the 48 options was an overwhelming task, a fatal-flaw analysis was conducted in order to reduce the number of options to a manageable level. The technical committee members were sent a package prior to the July 15, 1999 meeting that asked them to rate each option on a scale of 1 to 5 (1 being low and 5 being high) on two criteria; how reasonable the option is and how well each option addresses the transportation needs of the Hood Canal Bridge user. The responses from each committee member were then tallied, averaged for each option, and presented to the HCBRAC for review. The committee agreed to continue evaluation on those options that rated a 3.0 or above on both criteria.

As the fatal-flaw analysis removed nearly 80% of the options from further consideration, the technical committee then scrutinized their own results by discussing the disposition of each of the 48 options. The HCBRAC committee members used the opportunity to argue both for and against options that were to remain on the list for further consideration. Some options were not rated highly by the committee and dropped out of consideration such as:

- Providing an auto ferry across the Hood Canal because it would be prohibitively expensive with insurmountable environmental concerns and costs.
- Enhancing the operational characteristics of SR20 across Whidbey Island because the option would be costly and does not directly benefit the Hood Canal Bridge user.

Other options that had rated poorly before were brought back for further consideration if a committee member made a successful argument to keep the option on the list. These options included:

- Providing worker/driver buses and vanpools for commuter trips around the Hood Canal.
- Enhancing the US101 corridor by modifying bridges to relieve traffic at pinch points.

The stakeholders committee was given the opportunity to review and adjust the results of this analysis. In the end, some options were refined for further consideration. (See Table 5-2 for a short list of the 15 remaining options).

TABLE 5-2 – Short List of Options

1. Provide two-boat ferry service on the Port Townsend to Keystone run (sailing every 45 minutes).
2. Provide three-boat ferry service on the Port Townsend to Keystone run (sailing every 30 minutes).
3. Initiate Port Townsend to Edmonds car ferry.
4. Initiate Port Townsend to car ferry.
5. Initiate passenger only ferry between Port Townsend and Kingston.
6. Provide a dedicated night time freight priority ferry between Edmonds and Port Townsend.
7. Implement a Hood Canal Bridge Rideshare program.
8. Initiate a Port Townsend to Seattle passenger only ferry and increase transit service between existing Park and Ride lots and the ferry terminal.
9. Provide a passenger only ferry across the Hood Canal at the Lofall/Southpoint location, enhance existing Park and Ride facilities and build new Park and Ride facilities within a 15 minute radius of the ferry terminal.
10. Enhance the US101 corridor and transit areas by enhancing existing pullouts, enhancing or widening shoulders for pullouts and adding a passing lane in the Mount Walker vicinity.
11. Enhance the US101 corridor by modifying bridges along US101 to relieve traffic at pinch points.
12. Install appropriate signs at decision points leading to the Olympic Peninsula to direct drivers away the Hood Canal Bridge.
13. Work with local hotels and motels to encourage them to offer special rates to commuters.
14. Coordinate with cities, counties and chambers of commerce to target events and festivals that will occur during or around the time of the closure and develop an alternate schedule
15. Develop a comprehensive Hood Canal Bridge media outreach program.

5.3. MEASURES OF EFFECTIVENESS

In order to evaluate each option on how well it would meet the needs of the Hood Canal Bridge user, the technical committee brainstormed a list of Measures of Effectiveness (MOE). Initially, the HCBRAC brainstormed the following list of ten MOE:

Preliminary Measures of Effectiveness	
● Cost to Implement	● Environmental Impacts
● Travel Time	● Social Impacts (medical/schools)
● Person Through-put	● Rideshare Effectiveness (occupancy)
● Cost Effectiveness (\$/person mile)	● Economic Impact to Community
● Long-term Benefits	● Economic Impact to Individual Users

After the initial MOE list was developed, the Committee agreed to allow staff to define the screening criteria definitions and quantify the MOE. Upon review of the screening criteria, the HCBRAC agreed to the MOE definitions with some modifications. (See Appendix A, “Measures of Effectiveness”).

- The *Travel Time* screening criteria definition was confusing, so the technical committee decided the three travel markets, Olympic Peninsula to Seattle Area, Olympic Peninsula to Kitsap Peninsula, and Olympic Peninsula to Tacoma area, needed be identified separately.
- The *Person Through-put* definition was perceived to be purely a measure of capacity and therefore it was changed to *Capacity*.
- *Social Impacts* were difficult to quantify with any meaningful value and was eliminated as a measure of effectiveness.
- *Cost Effectiveness* was confusing, thus the MOE were split into *Cost per Person per Day Served* and *Cost per Vehicle per Day Served*. These MOE were quantified with numbers rather than consumer report type bullets.

The final list of MOE is as follows:

Measures of Effectiveness	
• Travel Time	• Rideshare Effectiveness
• Cost to Implement	• Economic Impact to Community
• Capacity	• Economic Impact to Individual Users
• Long-term Benefits	• Cost Per Person Served Per Day
• Environmental Impacts	• Cost Per Vehicle Served Per Day

Once the MOE were finalized and the HCBRSC had reviewed and approved the list, each of the 15 remaining options was rated. Additionally, the technical committee recognized a need to rate the likelihood of use by each of the five established user groups. The committees agreed to use the user groups defined in the *Results of the 1998 Hood Canal Bridge Origin and Destination Survey* to maintain some consistency with already established parameters.

User Group	
Leisure:	Those who use the bridge for recreational, social and personal trips (50% of all trips).
Commuter:	Those who use the bridge to travel to and from work on a daily basis (24% of all trips).
Business:	Those who use the bridge to travel to and from business appointments as part of their work day (9% of all trips).
Medical:	Those who use the bridge to travel to and from medical appointments and those trips generated by emergency medical services (8% of all trips).
Commercial:	Those who use the bridge to move freight and good to and from the Olympic and Kitsap Peninsulas (7% of all trips).

See attachment “MEASURES OF EFFECTIVENESS”



5.4. PUBLIC OUTREACH

The Closure Mitigation Plan is being developed through an open process that encourages public input and dissemination of information. Specific actions have included the distribution of two informational flyers and WSDOT/PRTPO sponsored open houses in each of the four counties closest to the bridge.

5.4.1. INFORMATIONAL FLYERS

The Closure Mitigation Plan's public outreach efforts have included the preparation and distribution of two informational flyers. This element of the public awareness program was intended to inform the general public of the need for the reconstruction of the east-half of the Hood Canal Bridge and the various alternatives being considered for mitigating the impacts of the bridge closure during construction.

The first flyer was distributed in October 1999. It provided background information on the history of the bridge and the public awareness program. The Closure Mitigation Planning Process, including a series of public open houses, was also briefly discussed in this flyer. The flyers were distributed to attendees at the four open houses held in Poulsbo, Port Hadlock, Port Angeles and Belfair. In addition, it was mailed out to individuals on the Hood Canal Bridge East-Half Replacement Project mailing list.

The second flyer was distributed by mail and at community events during January and February 2000. As a follow-up to the first flyer and the open houses, this flyer summarized the open house process and the input gathered from attendees. It outlined the answers received on questionnaires regarding bridge usage and potential options for mitigating impacts to a bridge closure. The flyer also listed preferred options chosen by attendees during an "informal poll" conducted at the open houses.

The image shows two informational flyers. The left flyer, titled "Hood Canal Bridge East-Half Replacement Project", details the "Development and Implementation Schedule for Closure Mitigation Plan" from Spring 1999 to Spring 2000. It includes sections for "BACKGROUND", "CLOSURE MITIGATION PLANNING PROCESS", "OPEN HOUSE MEETINGS", and "ACCOMPLISH PUBLIC NEED". The right flyer, also titled "Hood Canal Bridge East-Half Replacement Project", focuses on the "CLOSURE MITIGATION PLAN PUBLIC AWARENESS PROGRAM" and includes a "GENERAL COMMENTS" section with a list of public input items and a "HISTORICAL EAST-HALF BRIDGE REPLACEMENT PLAN" diagram.

5.4.2. OPEN HOUSES

The HCBRSC instructed staff to conduct a program to gather public input regarding the various options for mitigating the impacts due to closure of the Hood Canal Bridge during 2004*. Staff organized and conducted a series of four public open houses throughout the four county area of the PRTPO.

A series of four open houses were conducted during the weeks of September 27 and October 4, 1999.

Date	Meeting Location	Registered Attendees	Estimated Attendance
September 30	Poulsbo	26	35 – 40
October 5	Port Hadlock	58	65 – 70
October 6	Port Angeles	42	50 – 60
October 7	Belfair	3	3

The format for the open houses was informal. Numerous displays were prepared and exhibited relating information about the bridge closure, the process for developing a mitigation plan and the various options being considered. WSDOT and Consultant staff was present to answer questions and receive input. Each attendee was asked to complete a questionnaire, in order to gain more insight into the travel habits and patterns of those who travel frequently across the bridge. In addition, all attendees were afforded the opportunity to vote for their three “most preferred” options (from the short-list of fifteen). A total of 129 individuals registered at the “sign-in” table. However, staff estimates that nearly 170 people attended the meetings.

The Port Hadlock meeting had the greatest number of individuals in attendance. It drew people from Port Townsend, Sequim, Port Ludlow and the Tri-Area (Port Hadlock, Irondale and Chimacum). The majority of the people who attended the Port Hadlock meeting lived within close proximity of the Hood Canal Bridge. They typically stated that they used the bridge for commuting and for medical trips to Poulsbo or the Bremerton/Silverdale area.

5.4.3. QUESTIONNAIRE

A questionnaire was prepared and distributed at each of the open houses. The purpose of the questionnaire was to obtain information from attendees regarding typical trips across the Hood Canal Bridge. A number of the nine questions used were similar to the ones asked in the O&D Survey, therefore, the results of the open house questionnaire were compared to the survey. In many cases there were similarities, indicating that the O&D Survey captured a number of local residents. However, some distinct differences on specific origin and destination locations and the number of trips taken on weekends indicated that the O&D Survey captured travelers who were using the bridge for recreational purposes. A reproduction of the open houses questionnaire is included on the following pages.

* The project is now expected to be delayed at least one year due to recently decreased funding level. Updated schedule information will be provided at a later date.

HOOD CANAL BRIDGE EAST HALF REPLACEMENT

Open House Questionnaire

1. Typically, **from** what city or town are you traveling when using the Hood Canal Bridge?

2. Typically, **to** what city or town are you traveling when using the Hood Canal Bridge? _____
3. How many times per week do you cross the Hood Canal Bridge? _____
4. On which days, and how many times per day, do you typically use the Hood Canal Bridge?
(circle all that apply)

DAY	# OF USES
Monday	1 2 3 4 5 or more
Tuesday	1 2 3 4 5 or more
Wednesday	1 2 3 4 5 or more
Thursday	1 2 3 4 5 or more
Friday	1 2 3 4 5 or more
Saturday	1 2 3 4 5 or more
Sunday	1 2 3 4 5 or more

5. At which times do you typically use the Hood Canal Bridge? (check all that apply)
 - 6:00am - 8:00am _____
 - 6:00pm - 8:00pm _____
 - 8:00am - 12 Noon _____
 - 8:00pm - Midnight _____
 - 12 Noon - 4:00pm _____
 - Midnight - 6:00am _____
 - 4:00pm - 6:00pm _____
6. Generally, what are the primary purpose(s) of your trips? They are usually transportation to and/or from:
(circle all that apply)
 - a. Leisure (e.g. recreational, social, shopping)
 - b. Commuter (to and from work regularly)
 - c. Business (occasional business appointment or meeting)
 - d. Medical Appointment
 - e. Commercial
 - f. other _____
7. When crossing the Hood Canal Bridge, are you typically traveling by:
 - a. Auto/Passenger Van/Pickup Truck/Motorcycle _____
 - b. Recreational Vehicle / Motorhome _____
 - c. Transit(Bus, Vanpool, Worker/Driver Bus) _____
 - d. Commercial Vehicle _____
 - e. Other _____

HOOD CANAL BRIDGE EAST HALF REPLACEMENT

Open House Questionnaire

8. If there were no possibility of crossing of the Hood Canal Bridge and you were given the following options, how would you choose to travel between the Olympic Peninsula and areas east of the Hood Canal?

Please circle the three (3) alternatives you most prefer.

- a) Port Townsend to Keystone car ferry
- b) Port Townsend to Edmonds car ferry
- c) Port Townsend to Kingston car ferry
- d) Port Townsend and Kingston passenger only ferry
- e) Port Townsend to Seattle passenger only ferry
- f) Lofall to South Point (across Hood Canal) passenger only ferry
- g) Port Townsend to Edmonds night-time freight priority ferry
- h) Hood Canal Bridge Ride Share Program
- i) US101 around Hood Canal
- j) Instead of making the trip across Hood Canal, stay in a local hotel/motel
- k) Reschedule trip until after closure period

9. What other options would you prefer?

Comments: _____

We appreciate the opportunity to visit with you this evening and look forward to your input and feedback.
Thank you. -- **Washington State Department of Transportation**



*Peninsula Regional Transportation
Planning Organization*

The following is a summary of the questionnaire results:

1. The primary origin and/or destination locations were Port Ludlow, Port Angeles, Sequim and Port Townsend. The O&D Survey also identified these same locations as primary origins and destinations. In addition, the O&D Survey identified Poulsbo and Bremerton as frequent origins/destinations.
2. When asked how many times each week they traveled across the bridge, the open house respondents advised that 32 percent of them travel across the bridge 0 – 1 time per week, 22 percent said they crossed 2 – 4 times per week and 18 percent stated that they crossed the Hood Canal Bridge 10 – 14 times per week.
3. The total number of trips across the bridge appeared to be consistent each of the five weekdays. The open house respondents indicated that they traveled across the bridge more during the week than on weekends. In contrast, the O&D Survey found that weekend trips were slightly higher than weekday trips. This would indicate that the O&D Survey respondents included more recreational trips. This seems reasonable given that the O&D sampling was accomplished during June 1998.
4. Input regarding traffic volume trends throughout the day appeared consistent with the O&D Survey. Volumes grow in the early morning hours, peaking at mid-morning. They then plateau at that level until early evening when there is another small peak. Volumes then begin to drop off later in the evening.
5. When asked what purposes caused them to cross the bridge, 32 percent advised that they were typically making leisure trips for recreation, socializing and shopping. Commuters made up nearly 14 percent of the trips. And, 24 percent of the trips are reportedly for medical appointments.
6. Eighty-one percent (81%) of the travelers were in autos, vans, and pickup trucks or on motorcycles; as compared to RV's, transit or commercial vehicles.
7. The respondents were asked to choose the three (3) alternatives most preferred, as listed on the questionnaire. Twenty-two percent (22%) advised that the Port Townsend – Kingston car ferry was preferable. The Lofall – South Point passenger only ferry captured 18 percent of the vote. And the Port Townsend – Edmonds car ferry alternative received 17 percent of the vote.

5.4.4. OPINION POLL

An informal opinion poll was conducted at each of the meetings. Each attendee was given three adhesive dots and asked to “vote” for the options they preferred. The four “top vote getters” included:

- ◆ Port Townsend – Kingston Car Ferry
- ◆ Lofall – South Point Passenger Only Ferry
- ◆ Port Townsend – Edmonds Car Ferry
- ◆ Port Townsend – Seattle Passenger Only Ferry

6. COMMITTEE RECOMMENDATIONS – PREFERRED OPTION LIST

Information gathered at the Public Open Houses was then presented to the HCBRSC (October 15, 1999), HCBRAC (October 21, 1999) and the PRTPO Executive Council (November 19, 1999).

Both the HCBRAC and the HCBRSC completed the same “opinion voting exercise” that was conducted at the Open Houses (see Opinion Poll Summary Sheet on page 37). Eleven alternatives were then shortlisted from the results of the “three votes”.

Upon further review, the shortlist of options was refined during the December 10, 1999 HCBRSC meeting. The final list of alternatives recommended to WSDOT, by the HCBRSC, includes the following:

1.	Consider initiating <u>Port Townsend to Edmonds car ferry service</u> to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and King County.
2.	Consider initiating <u>Port Townsend to Kingston car ferry service</u> to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and the Kitsap Peninsula.
3.	Consider initiating <u>Port Townsend to Seattle passenger only ferry</u> and increase transit service between existing Park and Ride lots of ferry terminal to facilitate leisure, commuter, business, medical and commercial trips between the Olympic Peninsula and Seattle.
4.	Consider providing <u>passenger only ferry service across Hood Canal between Lofall and South Point</u> , enhancing existing Park and Ride facilities or building new facilities within fifteen minute radius of the ferry terminals and providing shuttle service between the canal, the Kingston ferry terminal and the Park and Ride facilities. This option would facilitate a percentage of the leisure, commuter, business and medical trips that are currently served by the bridge.
5.	Consider <u>enhancement of the US101 Corridor</u> by improving existing pullouts and adding passing lanes to facilitate those bridge users who would choose to travel around the canal rather than use ferry service.
6.	Consider providing a <u>freight barge across Hood Canal</u> to facilitate commercial trips between the Kitsap and Olympic Peninsulas.
7.	Consider implementing a <u>Hood Canal Bridge Closure Rideshare Program</u> (e.g. real time ride matching, vanpool program around canal, worker/driver buses around canal, shared vehicles at Park and Ride locations) to facilitate leisure, commuter, and medical trips.
8.	Consider <u>installing signs at decision points leading to the Olympic Peninsula</u> to notify drivers of the Hood Canal Bridge closure and suggest alternate routes. Signs shall be strategically placed to address all Hood Canal Bridge users.
9.	Consider initiating a <u>Hood Canal Bridge public outreach program</u> that includes a multi-faceted public relations program and outreach to cities, counties, chambers of commerce, and public services. Public outreach shall focus on all users and communities affected by the bridge closure.
10.	Consider <u>providing subsidized medical flights</u> between the Olympic Peninsula and Kitsap County or Seattle area.
11.	Consider <u>subsidized housing and/or motels</u> for commuter and medical trips that cannot be “adequately accommodated” by any other option.

These alternatives were then submitted to WSDOT for approval and further study.

See attachment "OPINION POLL"



7. NEXT STEPS

The Closure Mitigation Plan has been an ongoing process by WSDOT and the PRTPO. The Plan objective is to identify impacts of the bridge closure on users and potential alternatives to mitigate those impacts through the formation of a coalition of regional, local, and community partners. This community participation has included the formation of the HCBRSC and the HCBRAC, the distribution of informational flyers, and the seeking of input at open houses. The process has included a “fatal flaw” analysis of nearly 60 options, gathering of input from local communities and bridge users, discussion of identified impacts and needs, and shortlisting of eleven alternatives for further study.

Where do we go from here? WSDOT and the PRTPO, in conjunction with the Committees, will begin pre-design on the “shortlist” of preferred alternatives that resulted from the public process. A Preliminary Engineering effort will begin in early 2000 to evaluate the various mitigation options. This evaluation effort will consider the benefits of the alternatives, the costs of construction and implementation, the general viability of each alternative and the anticipated success of each alternative at addressing the impacts caused by the closure of the bridge. A Closure Mitigation Plan that includes a number of travel and information/education options will result from that engineering effort. It is anticipated that the analysis will be complete and the Closure Mitigation Plan ready for implementation by late 2001.



Appendix A

DEFINITIONS OF MEASURES OF EFFECTIVENESS

Definitions of Measures of Effectiveness

Travel Time: The times listed below represent the **additional** travel time required for the trip exchange listed; the total travel time will vary depending on origin and destination of the individual trip.

Olympic Peninsula ↔ Kitsap Peninsula (typ. 1 to 2 hours)

- + 15 Minutes
- + 30 Minutes
- + 45 Minutes
- + 1 Hours
- + 1 Hour 15 Minutes or More
- Option does not influence travel time or trip is eliminated

Olympic Peninsula ↔ Seattle/Bellevue (typ. 2 to 3 hours)

- + 15 Minutes
- + 30 Minutes
- + 45 Minutes
- + 1 Hours
- + 1 Hour 15 Minutes or More
- Option does not influence travel time or trip is eliminated

Olympic Peninsula ↔ Tacoma Area (typ. 2 to 3 hours)

- + 15 Minutes
- + 30 Minutes
- + 45 Minutes
- + 1 Hours
- + 1 Hour 15 Minutes or More
- Option does not influence travel time or trip is eliminated

Definitions of Measures of Effectiveness

Cost to Implement: Estimated cost of design and construction or implementation of the option.

- < \$50,000
- > \$50,000, but < 500,000
- > \$500,000, but < \$1 million
- > \$1 million, but < \$2 million
- > \$2 million

Capacity: The total number of users that can be accommodated by the option.

- The capacity to carry 25% of the average daily traffic on the bridge
- The capacity to carry between 10% and 25% of the average daily traffic on the bridge
- The capacity to carry less than 10% of the average daily traffic on the bridge

Long Term Benefits: The option will provide benefit either in whole or in part beyond the 6- to 8-week closure.

- Has A Long Term Benefit
- A Portion of the Option has a Long Term Benefit
- No Long Term Benefit

Environmental Impacts: (e.g. shoreline impacts from construction of passenger only facilities at Southpoint or Lofall)

- Low Impacts
- Moderate Impacts
- High Impacts

Rideshare Effectiveness: The ability of the option to promote ridesharing.

- Greatly Encourages Carpooling or Other Rideshare Opportunities
- Moderately Encourages Carpooling or Other Rideshare Opportunities
- Does Not Encourage Carpooling or Other Rideshare Opportunities

Definitions of Measures of Effectiveness

Economic Impact to Community: The cost to the community that will be experienced by implementation of the option.

- Low or No Cost (or Positive Impact) to Community
- Moderate Cost to Community
- High Cost to Community

Economic Impact to Individual User: The cost to the individual that will be experienced by implementation of the option.

- Low or No Cost to User
- Moderate Cost to User
- High Cost to User

Cost Per Person Served Per Day: The cost per person per day for each individual option. This assumes 17,500 people use the bridge per day and that the closure will be for the full eight weeks.

Cost Per Vehicle Served Per Day: The cost per vehicle per day for each individual option. This assumes 14,000 vehicles use the bridge per day and that the closure will be for the full eight weeks.

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www.wsdot.wa.gov/regions/olympic/construction/hoodcanal